UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Northwest Region
7600 Sand Point Way N.E., Bldg. 1
Seattle, WA 98115

Refer to:
2003/00841

July 9, 2003

Mr. Robert E. Willis
Chief, Environmental Resources Branch
Department of the Army
Portland District, Corps of Engineers
P.O. Box 2946
Portland, OR 97208-2946

Re: Magnuson-Stevens Fishery Conservation and Management Act Consultation and Essential Fish Habitat Conservation Recommendations for the Columbia River Channel Improvement Project

Dear Mr. Willis:

NOAA's National Marine Fisheries Service (NOAA Fisheries) has reviewed the January 2003 revised essential fish habitat (EFH) assessment provided by the Portland District of the U.S. Army Corps of Engineers (Corps) on groundfish and coastal pelagic species for the Columbia River Channel Improvement Project (Project). NOAA Fisheries has already completed our consultation on the salmon EFH for this project as part of our May 20, 2003, biological opinion (see Chapter 13). This document transmits the remaining portion of NOAA Fisheries' EFH conservation recommendations for this project pursuant to section 305(b)(4)(A) of the Magnuson-Stevens Fishery Conservation and Management Act (MSA), as amended by the Sustainable Fisheries Act of 1996 (Public Law 104-267).

The Corps stated in the EFH analysis of the proposed action that the impacts to EFH of groundfish and coastal pelagic species will be minimal in the Columbia River estuary and at the proposed deep water site (DWS) for the disposal of dredged material. However, some of the groundfish species potentially affected by the Project activities at the DWS have been declared overfished by the Pacific Fishery Management Council. The overfished status of these species calls for more detail in evaluation of potential impacts from the proposed activities to each of these species, and greater caution in assessing the significance of any adverse effects to EFH. To that end, we are providing a detailed effects analysis based on an expanded list of groundfish species (Appendix Table A-1). Based on the information we have to date regarding the DWS, coastal pelagic species are unlikely to be adversely affected by the proposed actions at that site.

A primary concern is whether the Corps has gathered and provided adequate site-specific habitat information about the DWS. The sampling conducted in June and September of 2002 may not have provided sufficient evidence to conclude that the DWS does not contain habitat that is unique or otherwise significant to managed fish species and their prey. The trawling equipment used in the 2002 surveys was not an appropriate type for capturing adult rockfish, and the results therefore potentially underestimate adult rockfish use of the site (B. Emmett and B. McCain, NOAA Fisheries' Northwest Fisheries Science Center, personal communication with Maggie Sommer, Oregon Habitat Branch, NOAA Fisheries, April 15, 2003). However, adults were collected using appropriate trawls during triennial surveys conducted between 1977 and 2001 by NOAA Fisheries' Alaska Fisheries Science Center in the vicinity of the DWS. These surveys demonstrate that proven technologies exist that can gather the information necessary to fully describe baseline fisheries information at the DWS and to compare the site to surrounding areas.

The project also includes a number of ecosystem restoration actions. If the proposed ecosystem restoration action at Lois Island Embayment is carried out in a manner that precludes use of the DWS, then there will be no impact to EFH at that site. However, if the DWS is used, EFH for groundfish would be adversely affected by disposal of dredged material. Adverse effects to groundfish EFH would be significant in the immediate location of the site. However, this area is small relative to the total habitat area available to the species involved, most of which occupy ranges that extend along large portions of the west coast of North America. Use of the DWS would not adversely affect EFH for coastal pelagic species.

We would welcome the opportunity to discuss these issues with you and identify how our agencies can work together on finding the best, long-term solution to handling dredged materials from the Columbia River navigation projects. If you have any questions, please contact Ms. Cathy Tortorici, Columbia River estuary coordinator, at 503.231.6268.

Sincerely,

For Michael R Crouse

D. Robert Lohn
Regional Administrator

Magnuson-Stevens Fishery Conservation and Management Act
Essential Fish Habitat Consultation

Columbia River Channel Improvement Project

Agency: U.S. Army Corps of Engineers

Consultation Conducted By: NOAA's National Marine Fisheries Service, Northwest Region

Date Issued: July 9, 2003

Issued by: for Michael R Crouse

D. Robert Lohn
Regional Administrator

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1. BACKGROUND

The Magnuson-Stevens Fishery Conservation and Management Act (MSA), as amended, established procedures designed to identify, conserve, and enhance essential fish habitat (EFH) for those species regulated under a Federal fisheries management plan. Pursuant to the MSA:

- Federal agencies must consult with NOAA's National Marine Fisheries Service (NOAA Fisheries) on all actions, or proposed actions, authorized, funded, or undertaken by the agency, that may adversely affect EFH (§305(b)(2));

- NOAA Fisheries must provide conservation recommendations for any Federal or state action that would adversely affect EFH (§305(b)(4)(A));

- Federal agencies must provide a detailed response in writing to NOAA Fisheries within 30 days after receiving EFH conservation recommendations. The response must include a description of measures proposed by the agency for avoiding, mitigating, or offsetting the impact of the activity on EFH. In the case of a response that is inconsistent with NOAA Fisheries' EFH conservation recommendations, the Federal agency must explain its reasons for not following the recommendations (§305(b)(4)(B)).

EFH means those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity (MSA §3). For the purpose of interpreting this definition of EFH: "Waters" include aquatic areas and their associated physical, chemical, and biological properties that are used by fish and may include aquatic areas historically used by fish where appropriate; "substrate" includes sediment, hard bottom, structures underlying the waters, and associated biological communities; "necessary" means the habitat required to support a sustainable fishery and the managed species' contribution to a healthy ecosystem; and "spawning, breeding, feeding, or growth to maturity" covers a species' full life cycle (50 CFR 600.10). Adverse effect means any impact which reduces quality and/or quantity of EFH, and may include direct (*e.g.*, contamination or physical disruption), indirect (*e.g.*, loss of prey or reduction in species fecundity), site-specific or habitat-wide impacts, including individual, cumulative, or synergistic consequences of actions (50 CFR 600.810).

EFH consultation with NOAA Fisheries is required regarding any Federal agency action that may adversely affect EFH, including actions that occur outside EFH, such as certain upstream and upslope activities.

On January 30, 2003, NOAA Fisheries received an EFH assessment for coastal pelagic and groundfish species from the Portland District of the U.S. Army Corps of Engineers (Corps) for the Columbia River Channel Improvement Project (Project).

The objectives of this EFH consultation are to determine whether the proposed action would adversely affect designated EFH, and to recommend conservation measures to avoid, minimize, or otherwise offset potential adverse effects to EFH.

2. IDENTIFICATION OF EFH

Pursuant to the MSA, the Pacific Fisheries Management Council (PFMC) has designated EFH for Federally-managed fisheries within the waters of Washington, Oregon, and California. Designated EFH for groundfish and coastal pelagic species encompasses all waters from the mean high water line, and upriver extent of saltwater intrusion in river mouths, along the coasts of Washington, Oregon and California, seaward to the boundary of the U.S. exclusive economic zone (370.4 km) (PFMC 1998a, 1998b).

Detailed descriptions and identifications of EFH are contained in the fishery management plans for groundfish (PFMC 1998a) and coastal pelagic species (PFMC 1998b). Casillas *et al.* (1998) provide additional detail on the groundfish EFH habitat complexes. The EFH conservation recommendations are based, in part, on these descriptions and on information provided in the Project's EFH assessment, in Environmental Protection Agency (2003), and in Appendix H of U.S. Army Corps of Engineers (1999).

3. PROPOSED ACTIONS AND ACTION AREAS

The Columbia River channel improvement project (Project) consists of improvements to the main Columbia River navigation channel, ecological restoration activities in the lower Columbia River,[1] and other associated activities. The channel improvements include the deepening of the main navigation channel in the Lower Columbia River from 40 feet to 43 feet, and improving the ship turning basins. Other activities include dredged material disposal and ecosystem restoration. The purpose of the proposed action is to remove existing depth constraints to vessel movements and thereby improve access to the ports of the lower Columbia River for deep draft vessels, and to restore ecological functions in the lower Columbia River for fish and wildlife.

The Corps maintains the Federal navigation channel in the Columbia River through operation and maintenance dredging. Currently, the navigation channel is maintained at an average depth of 40 feet, including advanced maintenance dredging up to 100 feet over-width and 5 feet over-depth.

Dredging and disposal will occur in two stages: (1) An initial construction program to deepen the existing navigation channel; and (2) a subsequent program to maintain the deepened navigation channel. The construction phase will last two years, and the maintenance phase will last the remainder of the authorized 50-year economic life of the Project. The Project will continue beyond 50 years unless un-authorized by Congress.

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[1] Two of the ecosystem restoration projects, the Lois Island Embayment and Miller/Pillar habitat creation projects, would be constructed using material dredged to construct the 43-foot deep navigation channel. However, if the dredged material is not used to construct those, or similar, restoration features, it would be placed in the proposed DWS.

3.1 Channel Deepening

The project area for channel improvements covers 11.6 miles of the Willamette River below Portland, Oregon, and 103.5 miles of the Columbia River, from river mile (RM) 3 to RM 106.5, below Vancouver, Washington. The Willamette portion will be deferred until the completion of a remediation investigation and decisions related to contaminated sediments in the Portland Harbor.

The Corps proposes to increase the depth of the Columbia River navigation channel from its presently authorized -40 feet Columbia River Datum (CRD), to -43 feet CRD. "Advanced maintenance" dredging will occur during the Project's construction and maintenance phases, including advanced maintenance dredging for up to 100 feet over-width and 5 feet over-depth for a maximum constructed navigation channel depth of 48 feet. This is a standard practice for operation and maintenance of the -40 foot CRD channel and is used to insure a safe operational depth between operation and maintenance dredging. The current navigation channel's 600-foot width will be maintained, with additional channel width at channel turns and in areas of high reoccurrence of shoaling. The improved navigation channel will exist in the same location as the current -40 foot CRD navigation channel. In addition, a total of three existing turning basins would be deepened to -43 feet CRD and maintained as part of the proposed action. Existing berths at three grain facilities, one gypsum plant, and one container terminal in the lower Columbia River, which are interrelated and/or interdependent to the Project, will be deepened to -43 feet CRD and maintained.

An estimated total of 19 million cubic yards (mcy) of sand, 76,000 cubic yards (cy) of basalt rock, and 240,000 cy of cemented sand, gravel, and boulders would be removed initially from the navigation channel using hopper, clamshell, and pipeline dredges. Once the improvements are completed, the channel will require annual maintenance dredging. Over the initial 20 years, annual maintenance dredging is likely to decline from around 8 mcy to about 3 mcy of sand annually as the new channel reaches equilibrium. Annual maintenance will then continue at an average of about 3 mcy of sand per year for the succeeding 30 years. This amounts to a total Project dredging quantity of about 190 mcy. During this same 50-year period, if the channel were not deepened, approximately 160 mcy would be dredged to maintain the currently authorized -40 foot CRD channel.

The Corps is proposing to employ contractors, Federal and port personnel, vessels, and equipment to implement the Project's dredging and disposal activities. Channel construction and maintenance will encompass a variety of dredging and dredged material disposal methods, as well as associated best management practices (BMPs). During Endangered Species Act section 7 consultation, NOAA Fisheries reviewed each portion of the action to develop additional impact minimization and BMPs, which the Corps has incorporated as a component of the proposed action. These BMPs (Table 1) are designed to avoid or minimize the potential adverse effects or *take* of ESA-listed salmonids. They will also serve to avoid or minimize the potential for adverse effects to EFH in the Columbia River and estuary. Construction and maintenance dredging BMPs will remain in effect during the life of the Project, or until new information becomes available that would warrant change. Contractors and other workers will be required to conduct dredging activities in compliance with the proposed action, including full implementation of BMPs, compliance monitoring, and reporting. Section 7.3 of the 2001 biological assessment (BA) for the Project contains a more complete description of the compliance monitoring program. It is incorporated herein by reference.

Project construction dredging, using any of the aforementioned dredging methodologies, may occur year-round until the navigation channel and turning basin deepening is complete. Future berth deepening and rock blasting will occur within a timing window of November 1-February 28, as recommended by the Oregon Department of Fish and Wildlife (ODFW). Project maintenance dredging for navigation channel or turning basin features will not have any in-water timing restrictions. However, the Corps has traditionally implemented navigation channel maintenance dredging from May through October of a given year, and anticipates that Project maintenance dredging will occur between May 1 and October 31 annually. Future berth maintenance dredging will occur within the ODFW work window of November 1-February 28.

Table 1. Dredging Methods, Descriptions, and Associated Best Management Practices

Dredging Method	Description (also refer to 2001 BA)	Best Management Practices
Hopper	Use dual dragarms to lower dragheads onto substrate. River bed materials are removed via suction to transport materials into the hold of the vessel. Generally used for small sand shoals in river and large sand shoals in estuary.	• Minimize entrainment by maintaining, to the extent possible, the draghead below substrate. Pumping must stop if dragarm is raised more than 3 feet above substrate. • Minimize turbidity by maintaining, to the extent possible, the draghead below substrate. • Contracts will specify compliance plans
Mechanical	Use bucket to remove materials and transfer to a barge for transport. Includes clamshell, dragline, and backhoe dredges. Mainly used during construction phase for removal of cemented sands, gravels, and fractured rock. Limited maintenance application, mainly in confined areas.	• Contractors will specify compliance plans • Future berth deepening and maintenance will occur within timing window of November 1-February 28

Dredging Method	Description (also refer to 2001 BA)	Best Management Practices
Pipeline	Use cutterhead on end of long pipe to remove sediments. River bed materials are removed via suction to a floating pipeline. The pipeline delivers the river bed materials to the disposal location.	• Minimize entrainment by maintaining, to the extent possible, the cutterhead below substrate. Pumping must stop if cutterhead is raised more than 3 feet above substrate. • Minimize turbidity by maintaining, to the extent possible, the cutterhead below substrate. • Contractors will specify compliance plans
Drilling and Blasting	Associated with channel construction at basalt rock outcrops. Holes would be drilled in underwater rock formation, and charges set to create an implosion.	• A blasting plan would be developed for each site. • Implosion rather than explosion. • Over-pressure from blast less than 10 psi. • Blasts will be monitored. • Fish "hazing" employed prior to blast to minimize likelihood of injury to fish. • Timing window of November 1-February 28.

3.2 Construction and Maintenance Disposal Activities

Dredged materials from Project construction and maintenance will be disposed of in upland, flowlane, shoreline, mitigation, and ecosystem restoration sites, and one ocean disposal location. Most of the Project's dredged material would be disposed of on upland locations. All dredged materials destined for flowlane, shoreline or ocean disposal will not exceed thresholds for sediment composition and quality, as identified in the Corps' and the Environmental Protection Agency's (EPA) Dredged Materials Evaluation Framework (DMEF). Table 2 outlines the various disposal options and volumes of dredged material. Disposal options and the associated material volume for the first 20 years include: 29 upland locations covering 1,755 acres (71 mcy); ocean (16 mcy; however, the proposed Lois Island and Miller/Pillar ecosystem restoration actions may use dredged material scheduled for ocean disposal, and would significantly reduce the total ocean disposal volume); flowlane (23 mcy); shoreline (1 mcy); two ecosystem restoration features (15 mcy); and one mitigation site (1 mcy).

The following methods and associated BMPs will be used for dredged material disposal (Table 2). These BMPs, which will be included in the final disposal plan, will avoid or minimize impacts to ESA-listed salmonid species and EFH from disposal activities. The BMPs will remain in effect throughout the Project, or until new information becomes available that would warrant change.

Table 2. Disposal Methods, Descriptions, and Associated Best Management Practices

Disposal Method	Description (also refer to 2001BA)	Best Management Practices
Upland	Materials pumped via slurry pipeline or hauled to upland site. Materials permanently held at upland site via earthen dikes. Any shoreline site associated with upland disposal will be restored.	• Upland sites bermed to maximize settling of fine materials. • New upland sites located a minimum of 300 feet from shoreline or other aquatic habitat feature. Existing sites may not have this habitat buffer, but currently provide limited habitat value. • Riparian vegetation will be protected. • Vegetative restoration will occur.
Flowlane	Either hopper or pipeline methods will use flowlane disposal. Dredged materials will be released within or adjacent to navigation channel.	• Maintain discharge pipe of pipeline dredge at depths greater than 20 feet. • Dispose of material in a manner that prevents in-water mounding.
Shoreline	Pipeline method primarily used for shoreline disposal. A sand and water slurry is pumped onto an existing beach or shoreline landing, and the beach is extended approximately 100-150 feet into and for varying distances along the river channel. Shoreline disposal occurs concurrently with dredging; timing restrictions therefore based on dredging methodology.	• Contour new beach to minimum steepness of 10-15% slope, to prevent fish stranding. • Only highly-erosive, and therefore lower habitat quality, shoreline sites will be used.
Ocean	A single, 200-300 foot deep ocean location, approximately 4.5 miles west of the Columbia River mouth, will be used for ocean disposal. Hopper dredges will release dredged materials in an 11,000 by 17,000 foot area.	• Dispose of material in accordance with the site monitoring and management plan which calls for a point dump placement of material from the project during construction. The plan is to place any construction material in the southwest corner of the deep water ocean site.
In-water fill	In-water fills will be used to create intertidal marsh and flats and shallow sub-tidal habitat at Miller Pillar, Lois Island Embayment and the Martin Island mitigation site.	• Historic elevations for tidal marsh and flats and shallow subtidal habitats at these locations will be constructed using clean dredged material.

Project disposal activities will not have any in-water timing restrictions. However, as disposal occurs at the same time as dredging activities, dredged material disposal associated with construction dredging will occur year round, whereas disposal associated with maintenance dredging most likely will occur from May through October.

3.3 Ecosystem Restoration Action

An ecosystem restoration feature will be constructed using dredge disposal material by the Corps in conjunction with project implementation. The Corps will implement actions to create or improve tidal marsh and flats habitat in the lower Columbia River.

Lois Island Embayment Habitat Restoration

This restoration feature entails placement of dredged material from the Columbia River navigation channel within the World War II-era constructed embayment at RM 19 in order to attain proper substrate elevations for development of tidal marsh habitat. The size of this restoration effort has been reduced from 357 acres to 191 acres, and the habitat objective changed to tidal marsh in response to comments received regarding the draft supplemental environmental impact statement (DSEIS) for the Project (U.S. Army Corps of Engineers 1998). Dredged material obtained from RM 3 to RM 29 would be initially stockpiled in a temporary sump adjacent to the navigation channel between river miles 18 to 20. A pipeline dredge would remove the material during the in-water work period (Nov. 1 – Feb. 28) and place it in the Lois Island embayment for tidal marsh development. Lois and Mott islands and South Tongue Point were all formed by dredged material disposal. These areas support tidal marsh and serve as an example of how to complete successful tidal marsh development. Elevation of these adjacent marshes will be surveyed and used as target elevations for construction of this feature. The construction effort would require approximately two years to complete, and would entail approximately 6 mcy of material. The Corps would rely on dispersion of marsh plant seeds and propagules by current and tidal action to establish a new marsh plant community.

3.4 Ocean Disposal: Deep Water Site for Ocean Disposal of Dredged Material

The deep water site (DWS) for ocean disposal of dredged material proposed for designation by EPA is located about 4.5 miles west of the entrance to the Columbia River and extends westerly another 2.5 miles. The site varies in depth from 200-300 feet with a relatively featureless bottom topography that gently slopes away from shore. Overall site dimensions, including a 3000-foot buffer zone, are 17,000 feet by 23,000 feet, occupying an area of approximately 8,976 acres (10.5 square nautical miles). Disposal will only occur in an inner 11,000-foot by 17,000-foot "placement area," which will occupy an area of approximately 4,293 acres (5.0 square nautical miles). The Corps expects material placed at the site to create a mound approximately 40 feet high within the placement area over the estimated 50-year life of the site. No direct disposal would be allowed anywhere in the buffer; however, dredged materials sloughing off the developing mound may enter the buffer zone.

Benthic populations have been sampled in the DWS and the area is considered to be moderately to highly productive, averaging between 8,000 to 10,000 organisms per meter squared in October and November of 1995 and from 5,000 to 8,000 in June of 1996.

The DWS will be used primarily for disposal of material from the mouth of the Columbia River project; however, it may also be used for disposal of material from maintenance dredging of the improved channel in later years. The new site is needed because existing ocean disposal sites were not as dispersive as originally thought and consequently have reached their capacities. The DWS has been sized to accommodate both projects for 50 years. The current preferred plan for the channel improvement project, which is addressed in the final SEIS for the Project, now includes ecosystem restoration features at Lois/Mott Islands and the area between Millar Sands and Pillar Rock Islands. If these two features are constructed, then ocean disposal should not be necessary for the project.

The action areas include habitats that have been designated as EFH for various life-history stages of 50 species of groundfish, 5 coastal pelagic species, and 2 species of Pacific salmon (Appendix Table A-1). NOAA Fisheries, upon review of available information, has expanded the list of groundfish species in the EFH assessment.

4. EFFECTS OF THE PROPOSED ACTION

The Project has several distinct components, including Project construction and maintenance, monitoring and adaptive management, and ecosystem restoration and research. The proposed actions would affect EFH for groundfish and coastal pelagic species by altering channel and bottom habitat through dredging and disposal.

4.1 Effects of Channel Improvement Project Construction and Maintenance Activities

Potential adverse effects to groundfish and coastal pelagic species include:

- Alteration of benthic topography by dredging and disposal.
- Removal or burial of benthic invertebrate populations.
- Temporary, repeated increases in turbidity.
- Temporary, repeated reduction of migratory habitat by disturbance.

<u>Alteration of benthic topography by dredging and disposal</u>
Dredging will lower the riverbed by 3 feet, in and adjacent to, the navigation channel. Long-term riverbed adjustments will occur on adjacent side slopes (see section 6.2.2.2 in NOAA Fisheries' May 2002 biological opinion (BO) on the channel improvement project). Within the riverine areas, 60% of the navigation channel will require deepening, whereas only 45% of the navigation channel in the estuary will require dredging. In-water and shoreline disposal of dredged materials will raise river and ocean bed elevations at disposal sites.

Changes in bathymetry from dredging and disposal may change river velocity, and thereby affect habitat value, particularly for juvenile fish. Modeling results indicated that average pre- and post-Project velocity differences would be small, ranging from approximately -0.2 foot per second to 0.2 foot per second. The largest velocity differences were predicted to occur in the navigation channel, with smaller changes in side channels and shallow areas, and are not likely to affect habitat suitability.

Changes in water surface elevations projected within the estuarine and riverine reaches are minimal and are not likely to alter the amount or location of EFH.

Disposal of dredged material may adversely affect EFH along the Columbia River. However, direct effects of dredged material disposal are not likely to be significant. Disposal areas were sited primarily on existing dredged material disposal sites or at locations behind flood control dikes, and these disposal sites typically provide negligible inputs of organic material (*e.g.*, detrital and insect faunal export) to the Columbia River, and thus are of limited value to EFH.

The proposed actions could affect the habitat-forming process of sediment accretion and erosion. The Corps predicts that riverbed side-slope adjustments and some shoreline erosion will alter the accretion and erosion patterns within shallow water and flats habitat in the lower Columbia River at five locations (RM 99, 86, 75, 72, and 46 through 42). A single location in the estuary, RM 22.5, is projected to experience riverbed side-slope adjustments; this is the only one of these locations where the proposed actions might affect EFH for groundfish and coastal pelagic species. The shoreline habitats likely to be affected provide feeding and rearing areas for some juvenile and adult groundfish, including English sole and starry flounder; therefore, any effects to these habitats are important to monitor and address. However, the shoreline sites are highly erosive and unstable, and do not provide high quality habitat for groundfish and coastal pelagic species.

Even though each of the six sandy beach sites may experience 10-50 feet of lateral erosion into the shoreline, minimal impact to EFH will occur. The side-slope adjustments will continue to occur for 5 to 10 years after construction. Over that time, shallow water and flats habitat at six shoreline disposal sites will tend to erode toward the shoreline and become deeper. The Corps determined that side-slope adjustments will not occur in natural shoreline areas because these riverbanks are stable; therefore, it is unlikely that tidal marsh and wetlands would be affected by side-slope adjustments.

Sand from upstream areas is one of the sources of material for habitat-forming accretion in the estuary. This sand is important to the formation of tidal marsh and wetlands, and shallow water and flats habitat. The volume of sand to be dredged over the life of the Project represents a small fraction of the total volume of sand in the riverbed. Therefore, the impact to habitat-forming processes from sand removal associated with the Project is likely be of a limited nature, and is not likely to adversely affect EFH.

NOAA Fisheries concurs with the Corps' assessment that impacts to the channel bottom are likely to be limited relative to past and current effects of dredging in the navigation channel, and that any adverse effects from channel bottom alteration are likely to be minimal.

<u>Removal or burial of benthic invertebrate populations</u>
Limited removal of organisms via dredging and disposal may remove or bury deposit feeders, suspension/deposit feeders, and suspension feeders in portions of the navigation channel, deep water areas, and the three shoreline disposal sites. Flowlane disposal will bury some animals and, if deposition of sediments is heavy, will result in the partial loss of some communities. Removal and burial effects are likely to be relatively short-lived, with dredge and disposal areas being recolonized by deposit feeders. Deposit feeders occur in low densities in the shifting sand waves of the navigation channel because of the naturally dynamic riverbed. In these and other areas of the river, densities fluctuate as a result of constantly changing environmental conditions. No changes to deposit feeders are likely in shallow water areas, side channels, or embayments, which are important feeding areas for juvenile groundfish. Long-term effects from dredging and disposal on deposit feeders, suspension/deposit feeders, and suspension feeders are difficult to predict. Because deposit feeders, suspension/deposit feeders, and suspension feeders are prey items for groundfish and coastal pelagic species, any removal of these organisms via dredging or disposal may adversely affect EFH for these fish species. However, because the loss of food items will not occur in the most important habitat types, and recolonization should occur relatively rapidly in dredging and disposal areas, the potential for such harm is minimal.

Dredging will result in removal of mobile macroinvertebrates from affected areas of the channel. Entrainment by dredges is likely to be to be lethal to macroinvertebrates. In addition, flowlane disposal may temporarily bury some animals and, if deposition of sediments is heavy, will result in the loss of some individuals. Effects to mobile macroinvertebrates from removal and burial are likely to be relatively short-lived, with dredged areas being recolonized within 6-12 months (Flemmer *et al.,* 1997). Mobile macroinvertebrates located in shallow water, flats, and tidal marsh channels are not likely be affected. Groundfish and coastal pelagic species may feed on certain mobile macroinvertebrates, and therefore any loss of these prey items via dredging or disposal may constitute an adverse effect to EFH. However, the effects will be localized to areas of low importance to these species and are likely to be minimal.

Overall impacts to benthic invertebrate communities and EFH in the navigation channel are likely to be limited, since the channel is not highly productive habitat due to regular disturbance from past and ongoing dredging and ship traffic.

<u>Temporary, repeated increases in suspended sediment levels</u>
Proposed dredging and disposal actions and future interrelated activities may increase suspended sediment concentrations and turbidity in the lower Columbia River, estuary and river mouth. Dredging operations are likely to cause downstream suspended sediment increases of 0-2 mg/L, depending on the number and type of dredges operating. Most of the dredging and disposal-induced suspended sediment should rapidly settle onto adjacent substrates. Based on the data

indicating that less than 1% of the dredged material is fine enough to remain in suspension following disposal, the Corps estimates that disposal of construction-related dredging will contribute up to 180,000 cy of suspended sediments over the two year construction period. Background suspended sediment loads for the same two-year period have been estimated at 4 mcy. The Project would have a maximum increase of 4.5% in the suspended sediment load and generally equates to an increase in suspended sediment concentrations of less than 1 mg/L. It is likely that these volumes will minimally influence accretion and erosion in EFH for groundfish and coastal pelagic species.

Dredging and in-water disposal will increase turbidity in deep water areas; local turbidity increases in shallow water areas are likely only during shoreline disposal. While high levels of turbidity are known to affect salmonid physiology and feeding success, the combined background and project-related turbidity concentrations are well below known salmonid impact levels (see 2001 BA, sections 4 and 6.1.4). Little is known about behavioral or physiological effects of increased turbidity on groundfish and coastal pelagic species, but elevated suspended sediment levels can elicit sublethal stress responses in fish, as well as damage gills and reduce feeding success (Servizi and Martens 1991).

In addition, turbidity affects the ability of light to penetrate into water, and in turn, affects the amount of plant growth that can occur. This is important for habitat development, particularly in the shallow water areas, because the plant growth provides organic material to the food web, creates structural habitat, and reduces erosion. Temporary, localized turbidity increases from Project construction and maintenance are not likely to produce detectable effects on plant growth in the lower river or estuary.

Fish may be attracted to turbidity plumes from dredging activities due to feeding opportunities created by suspension of invertebrates. Juveniles feeding in the area of active dredging may become entrained and killed.

Contaminants associated with dredged and disposed sediments may be resuspended in the ecosystem. However, much of the material to be dredged from the navigation channel will originate from existing sand waves, a dynamic natural feature of the river bottom, that are constantly on the move due to current action. These sand waves contain a small percentage of fine sediments and organic material, and thus have the potential to carry a limited amount of contaminants into natural resuspension from current action or dredging and disposal.

<u>Temporary, repeated reduction of migratory habitat by disturbance</u>
Disturbance of migrating, feeding, or resting fish by dredge operation is likely to be minor because the area in which the dredge is operating at a given time is small compared to the total width of the river, and because the dredges operate intermittently.

4.2 Effects of Habitat Restoration Activities

Potential adverse effects of proposed habitat restoration activities on groundfish and coastal pelagic species EFH include destruction of shallow water habitat and temporary increases in turbidity during and immediately following placement of fill material.

Destruction of shallow water habitat
Nearshore, shallow water areas will be filled to create tidal marshes at the two habitat restoration sites. The habitat that will be destroyed in the process is used by several species of groundfish, most prominently juvenile and adult English sole and starry flounder. Adverse effects to EFH for these species are likely to be minimal because of the small size of the area involved relative to the total amount of similar habitat available in the Columbia River estuary. Shallow water habitat has increased by approximately 4000 acres, or 10%, over the last century (Thomas 1983).

Benthic organisms and other prey items may be adversely affected during dredging and filling at the temporary sump and the Lois Island site. These actions may adversely affect EFH for groundfish and coastal pelagic species via loss of shallow water habitat and prey items, and turbidity plumes resulting from the actions. These effects should be limited to the sediment storage site and restoration site and will be limited in duration. Placement of sediments into the Lois Island embayment will be restricted to the November 1 to February 28 in-water work window of ODFW, when minimal numbers of salmonid fishes will be present. Adult and juvenile starry flounder and English sole are common in the area throughout the year, and larvae are common in winter and early spring. Northern anchovy adults use the area all year, while larvae and eggs of this species may be common from May through August (Monaco *et al.,* 1990).
Recolonization of the restored embayment by plants will take 5 to 10 years or more, depending on the species and their means of colonization. The tidal marsh fringing the embayment and the large expanses of tidal marsh in Cathlamet Bay represent a large source of plant propagules for the restoration site. Similarly, benthic organisms are abundant in Cathlamet Bay and represent an excellent source population for rapid recolonization of the embayment. Benthic productivity and related use by groundfish and coastal pelagic species may be reduced for an undetermined interim period as populations reestablish and densities increase.

Temporary increases in turbidity due to fill actions
Construction actions for the Lois Bay embayment restoration feature may result in temporary impacts to EFH of groundfish and coastal pelagic species. Materials to be placed in the embayment are primarily clean, medium-grained sands that meet the guidelines for in-water placement in accordance with the DMEF. Consequently, transfer of contaminated sediments will be avoided, and the turbidity plume associated with discharge into the restoration site is expected to be limited. The estuarine turbidity maximum (ETM) zone is the site of high primary and secondary productivity in the lower Columbia River estuary, and is

4.3 Effects of Disposal at the DWS

Potential adverse effects of dredged material disposal at the DWS on groundfish EFH include:

- Alteration of bottom topography.
- Elimination of benthic invertebrate populations that provide food or structural habitat for managed fish species.
- Alteration of sediment structure/composition.
- Dispersal of sediments outside of the designated DWS.

Potential adverse effects of dredged material disposal at the DWS on EFH for both groundfish and coastal pelagic species include:

- Disruption of physical processes in the water column.
- Temporary increases in turbidity during and immediately following disposal activities.
- Temporary reduction in EFH from disturbance during disposal events.

<u>Alteration of bottom topography</u>
The proposed designation will result in the eventual creation of a 40-foot-high, trapezoidal mound of sediment at the DWS. Although all material is to be placed within the inner drop zone, midwater or bottom currents and slumping likely will cause sediment dispersal during or after settling, and will result in the transport of some material into and possibly beyond the buffer zone. This will increase the size of the actual disposal footprint to larger than the proposed area. It is unclear from the discussion in appendix I, exhibit N of the final supplemental EIS if the analysis applies to sediment movement in general, or specifically to the resulting 40-foot high mound of sediment. Further investigation will be required to evaluate how mounding affects fish use and invertebrate community composition at the site.

Mounding at the disposal site is likely to affect wave action and currents and, in turn, may affect the Columbia River plume (*e.g.* by changing its location and characteristics). EFH for groundfish and coastal pelagic species may be affected by changes in hydrodynamic characteristics at the site and to the Columbia River plume. In order to address this concern, more information about potential effects is necessary.

<u>Elimination of benthic invertebrate populations</u>
Information collected by the Corps at the DWS confirms that the area has a variety of bottom types supporting a diverse community of benthic invertebrates. The substrate at the DWS has been characterized as having five different bottom types (fine sand/silt, polychaete tubes; fine sand/silt, indistinct polychaete tubes; fine sand; sand/sand waves; and sand), and 29 species of benthic invertebrates (October 29, 2002, Ocean Disposal Taskforce meeting; presentation: *MCR Ocean Disposal Sites, Preliminary Results on 200 Surveys*, MEC Analytical Systems, SAIC and EHI, 28-29, October; attachment D, exhibit N final supplemental EIS). Sampling in July and September of 2002 showed seasonal changes in benthic invertebrate assemblages, suggesting

that the area is affected by seasonal variations in level of detrital input and water movement/flow from the Columbia River. These results indicate that the DWS likely is highly productive, providing a diversity of prey for groundfish species.

Benthic invertebrates such as polychaete worms, crustaceans, molluscs, crinoids, *etc.* provide food and structural habitat for many managed fish species in the area of the DWS (Love *et al.* 2002). Many of these benthic organisms have limited mobility and would be buried and killed by the disposal of dredged sediments at the site. The result would be a reduction in the potential food source and habitat available to fish species in the area. Recolonization is uncertain while the site is in active use for dredged material disposal (projected 50-year life span), since the maximum interval between disposal events would be approximately one year. Recolonization potential is affected by the length of intervals between deposition events, particle size, currents, and compaction/stabilization following deposition (Newell *et al.* 1998; Van der Veer *et al.* 1985). Rates of recovery listed in the literature range from several months for estuarine muds, and up to 2-3 years for sands and gravels (Hitchcock *et al.*1999). Recolonization may take longer in areas with lower nutrient levels and low currents, such as the DWS (Van der Veer *et al.* 1985).

<u>Alteration of sediment structure/composition</u>

Sediments to be disposed of at the site would be coarser than those currently there. Regular disturbance and changes in sediment type are likely to result in different benthic organisms inhabiting the area (R. Wheatcroft, Oregon State University, personal communication with M. Sommer, Oregon Habitat Branch, NOAA Fisheries, April 17, 2003). If new communities of benthic invertebrates are able to become established at the site, they may not include specific prey species required by managed fish species foraging in the area.

<u>Disruption of physical processes in the water column</u>

The presence of a mound of disposed sediments may alter bottom currents, with possible unanticipated effects on the benthic and water column microhabitats in the immediate area of the DWS, as well as on bottom flows and onshore nutrient transport. Processes such as the movement of dense near-bottom fluid (*i.e.*, water combined with suspended and dissolved materials) onshore during upwelling and offshore during downwelling; propagation of internal waves within the bottom fluid layer moving back up the continental shelf during downwelling; and the movement of bottom-trapped and highly nonlinear, large-amplitude solitary waves enrich the water column over the shelf from deeper, offshore waters. Disruption of these flows would affect the onshore transport of nutrients (J. Moum, Oregon State University, personal communication with M. Sommer, Oregon Habitat Branch, NOAA Fisheries, April 17, 2003), potentially degrading habitat around and inshore of the DWS.

The sediment mound may also alter the Columbia River plume. Mounding at the DWS (which is in the vicinity of the Columbia River plume) could affect wave action and current characteristics, and, in turn, affect the plume by changing its location or other characteristics. Effects to fish from disruption of the Columbia River plume could include interference with or displacement of feeding or migratory activity, reduced prey availability, and altered predator abundance.

Dispersal of sediments outside of the designated DWS

Sediments disposed of at the DWS can reasonably be expected to be re-mobilized by bottom currents and waves (R. Wheatcroft, C. Goldfinger, and J. Moum, Oregon State University, personal communication with M. Sommer, Oregon Habitat Branch, NOAA Fisheries, April 17, 2003), although the Corps believes the sediments will not move once on the bottom at the site (appendix I, exhibit N, final supplemental EIS). Therefore, the potential area affected could extend beyond the DWS. In particular, sediments may tend to move northward, driven by winter currents, toward Astoria Canyon. Appendix A, exhibit N of the final supplemental EIS identifies sediment pathways, but does not discuss them in the context of potential impacts to the Astoria Canyon. NOAA Fisheries is concerned about potential sediment movement because the habitat types found in and bordering on Astoria Canyon are geographically limited and may provide unique or otherwise especially valuable habitat to managed fish species (W. Wakefield, NOAA Fisheries Northwest Fisheries Science Center, personal communication, April 11, 2003).

Any problems caused by the movement of a limited amount of dredged material into the canyon more likely would stem from contaminants associated with the material than with the sediments themselves (C. Goldfinger, Oregon State University, personal communication to M. Sommer, Oregon Habitat Branch, NOAA Fisheries, April 17, 2003; W. Wakefield, NOAA Fisheries Northwest Fisheries Science Center, personal communication, Oregon Habitat Branch, NOAA Fisheries, April 18, 2003). Appendix B (pages 8-9), exhibit N of the final supplemental EIS identifies a chemical baseline for the DWS. Sediments to be disposed at the site will be tested and must meet the ocean disposal standards in the dredged material evaluation framework (DMEF). Existing contaminant loadings at the site may be exacerbated by the addition of dredged materials. The DMEF is currently under review to address contaminant testing requirements and sediment disposal criteria for groundfish and ESA-listed species. Until that review is completed, potential effects on fish and suitability of dredged material from this project for disposal at the DWS remain somewhat uncertain.

Temporary increases in turbidity during and immediately following disposal events

The EPA expects sediments to reach the ocean floor at the DWS approximately 35 minutes after dumping. Suspended sediments could remain elevated in the area for longer periods of time than the actual release of dredged material from the transporting ships, and the exposure to suspended sediment plumes from dredged material disposal will probably be on the order of minutes to hours in duration (Wilbur and Clarke 2001). Turbidity, including that due to suspended sediment, can at moderate levels reduce primary and secondary productivity, and at high levels can injure or kill adult and juvenile fish, and may also interfere with feeding (Bjornn and Reiser 1991; Servizi and Martins, 1991; Spence *et al.* 1996). In salmonids, behavioral avoidance of turbid waters may be one of the most important effects of elevated suspended sediments (Scannell 1988, Birtwell *et al*. 1984, DeVore *et al*. 1980). Little is known about the behavior of most groundfish and coastal pelagic species in response to suspended sediments. Factors affecting response to elevated suspended sediments include fish size, water temperature, shape of the suspended particles, and particle concentration (Servizi and Martins 1991).

Temporary reduction of EFH from disturbance during disposal of dredged material
Disposal of dredged material is likely to occur regularly during the dredging season. Disturbance from dredged material settling through the water column to the bottom may cause fish to temporarily leave or avoid the area. This result would result in temporary but recurrent reductions in the amount of EFH available for fish use.

4.4 Impacts to Groundfish Species of Particular Concern

The area of EFH affected by the DWS is minimal relative to the total ranges of the managed species. NOAA Fisheries has not determined a percentage of habitat area that would be adversely affected by use of the DWS. Since 1996, the Pacific Fishery Management Council has declared nine species of groundfish under its management to be overfished (*i.e.*, with current biomass below 25% of the estimated unexploited level). The January, 2003 EFH assessment for the Columbia River channel improvement project does not address in sufficient detail the potential effects of the proposed action on the habitat any of these species.

The overfished status of these stocks calls for special consideration of the biological implications of effects on EFH. Several of the overfished species are not of particular concern in this instance, either because they are found entirely or primarily south of the action area (*i.e.*, cowcod, bocaccio), or are not strongly associated with benthic habitats at any life stage (*i.e.*, Pacific whiting). Stock status, life histories, and potential adverse impacts to EFH from the proposed activities are discussed in greater detail below for each of the remaining six overfished species: (1) Darkblotched rockfish, (2) lingcod, (3) canary rockfish, (4) widow rockfish, (5) Pacific ocean perch, and (6) yelloweye rockfish.

Darkblotched Rockfish
Darkblotched rockfish were at 14% of unfished levels in 2002, with estimated recovery time with no fishing at 14 years (PFMC 2003). Ninety-five percent of darkblotched rockfish are found at depths of 50-400 meters (Allen and Smith 1988), and both juveniles and adults prefer soft substrates and low-relief reefs (Love *et al.*, 2002). Thirty-two darkblotched rockfish, primarily juveniles, were caught in 9 out of 42 bottom trawls in the area of the proposed DWS during triennial surveys conducted between 1977 and 2001 by NOAA Fisheries' Alaska Fisheries Science Center (M. Wilkins, NOAA Fisheries Northwest Fisheries Science Center, personal communication to C. Tortorici, Oregon Habitat Branch, NOAA Fisheries, October 16, 2002). Because of this species' preference for habitat types like the DWS and its demonstrated occurrence in the area, the disposal of dredged material at the site is likely to adversely affect EFH for darkblotched rockfish.

Lingcod

The population of lingcod has decreased 85% in the last 30 years; stock in the International North Pacific Fisheries Commission's Columbia subarea is estimated at 8.8% of unfished levels (Jagielo *et al.* 1997). High catch rates are reported off the Columbia River (Love *et al.* 2002). Lingcod are found at depths of 0-475 meters (Casillas *et al.* 1998). Adults are common in areas shallower than 200 meters, and juveniles are common shallower than 150 meters (Jagielo *et al.* 1997). They are demersal, usually preferring rock reefs, algae beds, and areas with high current. One hundred and twenty-eight lingcod were caught in 24 out of 42 bottom trawls in the area of the proposed DWS during triennial surveys conducted between 1977 and 2001 by NOAA Fisheries' Alaska Fisheries Science Center (M. Wilkins, NOAA Fisheries Northwest Fisheries Science Center, personal communication to C. Tortorici, Oregon Habitat Branch, NOAA Fisheries, October 16, 2002). Because of this species' demonstrated occurrence in the area, disposal of dredged material at the site is likely to adversely affect EFH for lingcod.

Canary Rockfish

Spawning biomass of canary rockfish was estimated in 2002 to be 8% of the unfished level, and there have been severe declines since 1999 (Methot and Piner 2002b). The estimated stock recovery time with no fishing is 57 years (Methot and Piner 2002a). There is a major population of canary rockfish off Oregon (Casillas *et al.* 1998). Most canary rockfish are found at depths of 80-200 meters (Love *et al.* 2002); however, juveniles may settle from their planktonic stage to the bottom at shallower depths and migrate deeper down the continental shelf as they age (Love 1991). Adult canary rockfish prefer hard bottoms, rock reefs, and pinnacles (Love *et al.* 2002). Forty canary rockfish (juveniles and adults) were caught in 7 out of 42 bottom trawls in the area of the proposed DWS during triennial surveys conducted between 1977 and 2001 by NOAA Fisheries' Alaska Fisheries Science Center (M. Wilkins, NOAA Fisheries Northwest Fisheries Science Center, personal communication to C. Tortorici, Oregon Habitat Branch, NOAA Fisheries, October 16, 2002). Because of this species' demonstrated occurrence in the area, disposal of dredged material at the site is likely to adversely affect EFH for canary rockfish.

Widow Rockfish

Widow rockfish were at 23.6% of the unfished level in the most recent assessment (Williams *et al.* 2000). They are a deep water species; most adults are found at depths of 100-300 meters, although large juveniles may be found as shallow as 9 meters (NOAA 1990; Eschmeyer *et al.* 1983). Widow rockfish prefer rocky banks and ridges, seamounts, and mud near rocks (Love *et al.* 2002). One individual of this species was found in one out of 42 bottom trawls in the area of the proposed DWS during triennial surveys conducted between 1977 and 2001 by NOAA Fisheries' Alaska Fisheries Science Center (M. Wilkins, NOAA Fisheries Northwest Fisheries Science Center, personal communication to C. Tortorici, Oregon Habitat Branch, NOAA Fisheries, October 16, 2002). Disposal of dredged material at the site may adversely afffect EFH for widow rockfish, but because of this species' preference for high-relief habitats and low demonstrated occurrence in the area, such effects are likely to be minimal. However, because of the species' overfished status, the Corps should specifically consider widow rockfish in the monitoring and management of the DWS.

Pacific Ocean Perch
Pacific ocean perch were at 21.7% of the unfished level in 1998 (Ianelli *et al.* 2000). They are a deep water species, with most found at depths of 100-450 meters (NOAA 1990). Juveniles may be found as shallow as 37 meters, and move deeper with age (Love *et al.* 2002) Pacific ocean perch are primarily planktivores; they are an important forage fish for salmon, lingcod, sablefish, other groundfish, seals, and tuna (Love *et al.* 2002). Pacific ocean perch prefer rocky structures and sea whips, as well as canyons and submarine depressions (NOAA 1990). No Pacific ocean perch were observed in any of the 42 bottom trawls conducted in the area of the proposed DWS during triennial surveys between 1977 and 2001 by NOAA Fisheries' Alaska Fisheries Science Center (M. Wilkins, NOAA Fisheries Northwest Fisheries Science Center, personal communication to C. Tortorici, Oregon Habitat Branch, NOAA Fisheries, October 16, 2002). Disposal of dredged material at the site may adversely affect EFH for Pacific ocean perch, but because of this species' preference for high-relief habitats, low demonstrated occurrence in the area, and preference for planktonic prey, the effects are likely to be minimal. However, because of the species' overfished status, the Corps should specifically consider Pacific ocean perch in the monitoring and management of the DWS.

Yelloweye Rockfish
Yelloweye rockfish stocks have declined continuously over the last 30 years and are at 13% of the unfished level in Oregon (Wallace 2001). Stock rebuilding time with zero fishing is estimated to be at least several decades (Wallace 2001). Yelloweye rockfish are found in rugged, rocky habitats at depths of 25-550 meters (Allen and Smith 1988). No instances of this species were observed in any of the 42 bottom trawls conducted in the area of the proposed DWS during triennial surveys between 1977 and 2001 by NOAA Fisheries' Alaska Fisheries Science Center (M. Wilkins, NOAA Fisheries Northwest Fisheries Science Center, personal communication to C. Tortorici, Oregon Habitat Branch, NOAA Fisheries, October 16, 2002). Disposal of dredged material at the site may adversely affect EFH for yelloweye rockfish, but because of this species' preference for high-relief habitats and low demonstrated occurrence in the area, effects are likely to be minimal. However, because of its overfished status, the Corps should specifically consider yelloweye rockfish in the monitoring and management of the DWS.

5. CONCLUSION

The proposed actions will adversely affect EFH for groundfish and coastal pelagic species in the lower Columbia River and estuary. Based on the effects analyses summarized above, the most predictable impacts will be short-term, physical changes during the construction and subsequent maintenance periods of the Project. Impacts to key physical processes (*i.e.*, alteration of benthic topography, increases in suspended sediment) will be limited in extent and duration during the construction and maintenance periods.

If the proposed ecosystem restoration action at Lois Island Embayment is carried out in a manner that precludes use of the DWS, then will be no impact to EFH at that site. However, if the DWS is used, EFH for groundfish would be adversely affected by disposal of dredged material. Adverse effects to groundfish EFH would be significant in the immediate location of the site. However, this area is small relative to the total habitat area available to the species involved, most of which occupy ranges that extend along large portions of the west coast of North America. Use of the DWS would not adversely affect EFH for coastal pelagic species.

In reaching these conclusions, NOAA Fisheries relied on the best available scientific and commercial data.

6. EFH CONSERVATION RECOMMENDATIONS

Pursuant to section 305(b)(4)(A) of the MSA, NOAA Fisheries is providing the following EFH conservation recommendations for the mouth of the Columbia River maintenance dredging program:

1. The Corps, in coordination with EPA Region 10, should conduct more detailed analyses of the DWS to determine the importance of the area relative to the surrounding ocean floor in terms of habitat quality for managed fish and their major prey species. This analysis should involve a re-evaluation of the information in Appendix H of FEIS - Exhibit A and the report, Environmental Studies at Proposed Ocean Disposal Site off the Mouth of the Columbia River, Final Report, 2003, to conduct a habitat-based analysis of alternatives to the proposed action that could avoid or minimize adverse effects on EFH, as required by the Federal EFH regulations (50 CFR 600.920(e)(4)(iv)). Studies should include a survey for fish presence at the site using sampling gear and methods appropriate for capturing adult and juvenile groundfish. This should be completed before the site is used for disposal so that adequate pre-disposal baseline information is available for comparison with information from future monitoring.

2. The Corps should work with EPA Region 10 and NOAA Fisheries, to revise the Site Management/Monitoring Plan (SMMP), (Mouth of the Columbia River (MCR), Shallow Water and Deep Water, Ocean Dredge Material Disposal Sites (ODMDS)) in cooperation with NOAA Fisheries, in order to assess biological impacts of disposal at the DWS. A comprehensively developed SMMP is necessary for verification of assumptions and conclusions regarding long-term effects to EFH for groundfish, coastal pelagic species, and Pacific salmon. When implemented, monitoring should focus on effects to benthos (*e.g.*, invertebrate recolonization) and dependent fish species. The following elements should be fully discussed in the SMMP:
    a. How the buffer zone is going to be used as a reference site;
    b. Where in the monitoring process (Figure 4., page 19) of the SMMP the reference site is included as part of the actual monitoring process;

c. What are the specific triggers (page 16 of the SMMP) and quantified changes (page 17 of the SMMP) that the actions agencies will used to determine whether a change in the monitoring program and/or site management is necessary;

d. How the word "significantly" is defined in the portion of the SMMP describing Typical Evaluation Questions; and

e. The structure and decision-making process to be used to implement the portion of the SMMP devoted to Coordinated Management of the Site (page 20). Re-valuation of this portion of the SMMP should include the development of an adaptive management plan for the DWS.

3. The Corps, in conjunction with EPA Region 10, should expand the monitoring area to assess whether sediments are re-mobilized and transported out of the designated site, and effects to habitat in areas receiving the sediments. This analysis should re-evaluation whether it appropriate to use the buffer zone as the reference site for the DWS.

7. RESPONSE REQUIREMENT

Section 305(b)(4)(B) of the MSA requires the Corps of Engineers to provide NOAA Fisheries with a detailed written response to these EFH conservation recommendations, including a description of measures adopted by the Corps for avoiding, mitigating, or offsetting the impact of the project on EFH. In the case of a response that is inconsistent with NOAA Fisheries' recommendations, the Corps must explain its reasons for not following the recommendations, including scientific justification for any disagreements with NOAA Fisheries over the anticipated effects of the proposed action and the measures needed to avoid, minimize, mitigate, or offset such effect (50 CFR 600.920(j)).

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Table 3. Fish Species with EFH in the Columbia River Channel Improvement Project Action Areas (including the Deep Water Site)

Species	Adults	Spawning/ Mating	Eggs/ Parturition	Larvae	Juveniles/ Small Juveniles	Large Juveniles	Habitat Preferences	Depth Range
GROUNDFISH								
Darkblotched Rockfish *Sebastes crameri*	X	X	X			X	soft bottoms, rocks, bottom structures; prefer soft substrate, low relief reefs.	95% 50-400m. Benthic juveniles in Oregon may be found between 55-200m
Canary Rockfish *Sebastes pinniger*					X		hard bottoms, rock reefs, pinnacles, drop-offs	most 91-183m (settle shallow & move deeper with age)
Pacific Ocean Perch *Sebastes alutus*	X					X	rocky structures; sea whips	97% 100-450m
Widow Rockfish *Sebastes entomelas*	X	X	X		X	X	rocky banks, ridges, seamounts, mud near rocks	mostly 100-300m; large juveniles 9-37m
Lingcod *Ophiodon elongatus*	X	X	X			X	rock reefs, algae, high current	0-475m; adults common 10-70m, juveniles<150m
Yellowmouth Rockfish *Sebastes reedi*						NA	rocky, rough bottom	adults: 137-366m
Arrowtooth Flounder *Atheresthes stomias*	X	X			X	NA	sand, mud, sandy gravel	18-900m
Butter Sole *Isopletta isolepsis*	X	X				NA	mud, silt	0-366m
Curlfin Sole *Pleuronectes decurrens*	X	X				NA	soft bottoms	most 0-90m
Dover Sole *Microstomus pacificus*	X	X			X	NA	mud, muddy sand	adults: 91-1010m, most below 200m; juveniles: 100-700m, most below 200m; post-settlement nursery area between 100-119m off OR
English Sole	X	X			X	NA	sand, mud	most 0-250m

Table 3. Fish Species with EFH in the Columbia River Channel Improvement Project Action Areas (including the Deep Water Site)

Species	Adults	Spawning/ Mating	Eggs/ Parturition	Larvae	Juveniles/ Small Juveniles	Large Juveniles	Habitat Preferences	Depth Range
Pleuronectes vetulus								
Flathead Sole *Hippoglossoides elassodon*	X	X			X	NA	mud, sand	most 0-366m
Pacific Sanddab *Citharichthys sordidus*	X	X			X	NA	sand	most between 37-90m in OR & WA
Petrale Sole *Eopsetta jordani*	X				X	NA	mud, sand	most 0-300m
Rex Sole *Glyptocephalus zachinus*	X	X			X	NA	mud, sand	96% 50-450m
Rock Sole *Lepidopsetta bilineata*	X	X	X		X	NA	sand, gravelly bottoms, mud-sand	most 0-300m
Sand Sole *Psettichthys melanosticus*	X	X			X	NA	mud, sand	most <150m, prefer shallower
Starry Flounder *Platichthys stellatus*	X	X			X	NA	mud, sand; often found in estuaries and upstream in freshwater	most <150m
Big Skate *Raja binoculata*	X	X	X	NA	X	NA	mud	most common 50-200m; egg cases by far most abundant at 64m
California Skate *Raja inornata*	X	X	X	NA	X	NA	mud	common shallow, inshore; found to 671m

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Species	Adults	Spawning/ Mating	Eggs/ Parturition	Larvae	Juveniles/ Small Juveniles	Large Juveniles	Habitat Preferences	Depth Range
Longnose Skate *Raja rhina*	X	X	X	NA	X	NA	mud	most frequent 100-150m
Soupfin Shark *Galeorhinus zyopterus*	X	X	X	NA	X	NA	mud	2-471m
Spiny Dogfish *Squalus acanthias*	X		X	NA		X	mud	most < 300m
Pacific Cod *Gadus macrocephalus*	X	X	X		X	NA	mud, sand, clay, gravel	most common 50-300m
Pacific Rattail *Coryphaenoides acrolepis*	X	X			X	NA	sand	most common below 1500m in NE Pac
Sablefish *Anoplopoma fimbria*	X					X	mud, sand	adults prefer deep (>200m) water but juveniles are found inshore and inhabit progressively deeper waters with age
Spotted Ratfish *Hydrolagus colliei*	X	X	X	NA	X	NA	mud, low relief rocky bottom, gravel, cobble	most common 100-150m
Aurora Rockfish *Sebastes aurora*	X	X				X	soft bottom	96% 150-500m
Black Rockfish *Sebastes melanops*						X	kelp, seagrass beds, high relief rock	most 12-54m
Blue Rockfish *Sebastes mystinus*						X	kelp, high relief rock	most 25-40m
Bocaccio *Sebastes paucispinis*	X				X	X	midwater, over rock, algae, sometimes firm sand/mud; migrate offshore with age	Most common between 100-150m
Brown Rockfish *Sebastes auriculatus*						NA	low relief hard bottoms, drift algae, canyons	most common <53m

Table 3. Fish Species with EFH in the Columbia River Channel Improvement Project Action Areas (including the Deep Water Site)

Species	Adults	Spawning/ Mating	Eggs/ Parturition	Larvae	Juveniles/ Small Juveniles	Large Juveniles	Habitat Preferences	Depth Range
Chilipepper *Sebastes goodei*	X		X		X	X	high relief rock; occasionally on flat, hard bottoms	most 75-325m
China Rockfish *Sebastes nebulosus*						NA	rock reefs, cobble, high-energy areas	most <92m
Copper Rockfish *Sebastes caurinus*					X	NA	generalists but never on exclusively sand	0-183m
Greenspotted Rockfish *Sebastes chlorosticus*	X		X		X	NA	high-relief rock reefs, soft bottoms: juveniles: soft bottoms	adults: 90-179m; juveniles: 30-89m
Greenstriped Rockfish *Sebastes elongatus*	X		X		X	NA	mud, sand, rock	95% 150-250m; juveniles 30-89m
Quillback Rockfish *Sebastes maliger*					X		rocks, coarse sand or pebbles next to reefs	most 21-60m
Redbanded Rockfish *Sebastes babcocki*	X					NA	soft and hard substrate	97% 150-450m
Rosethorn Rockfish *Sebastes helvomaculatus*	X		X			NA	boulders, cobbles, sponges, rock	96% 100-350m
Rougheye Rockfish *Sebastes aleutianus*	X				X	NA	soft bottoms	94% 50-450m
Sharpchin Rockfish *Sebastes zacentrus*	X		X			NA	rock, mud, dense crinoid fields	96% 100-350m
Shortbelly Rockfish *Sebastes jordani*	X		X		X		juveniles: soft bottoms	most 150-200m

Table 3. Fish Species with EFH in the Columbia River Channel Improvement Project Action Areas (including the Deep Water Site)

Species	Adults	Spawning/ Mating	Eggs/ Parturition	Larvae	Juveniles/ Small Juveniles	Large Juveniles	Habitat Preferences	Depth Range
Shortraker Rockfish *Sebastes borealis*	X					NA	fine-grained sediment; boulders, pebbles, hard steep slopes	95% 50-650m; most common below 200m
Shortspine Thornyhead *Sebastolobus alascanus*	X				X	NA	mud	100-1400m
Silverygray Rockfish *Sebastes brevispinis*	X					NA	rocky bottoms	95% 100-300m
Splitnose Rockfish *Sebastes diploproa*	X		X		X	NA	mud near rocks, soft low-relief substrate	98% 100-450m
Stripetail Rockfish *Sebastes saxicola*	X		X		X	NA	sand, soft bottoms	97% 10-350m
Vermilion Rockfish *Sebastes miniatus*					X	NA	adults: rocks & hard substrate; juveniles: sand with no algae, hard or soft low-relief substrate	adults: 7-239m, juveniles 5-30m
Yellowtail Rockfish *Sebastes flavidus*	X	X	X		X	X	rocky structures, steep slopes	most 140-210m, juveniles: 20-37m
COASTAL PELAGIC SPECIES								
Northern Anchovy *Engraulis mordax*	X		X	X	X	X	pelagic	n/a
Pacific Sardine *Sardinops sagax*	X		X	X	X	NA	pelagic	n/a
Pacific (Chub) Mackerel *Scomber japonicus*	X		X	X	X		pelagic	n/a
Jack Mackerel *Trachurus symmetricus*	X						pelagic	n/a
California Market Squid *Loligo opalescens*	X	X	X	X	X		pelagic; eggs attached to sand/mud bottoms	shelf

Table 3. Fish Species with EFH in the Columbia River Channel Improvement Project Action Areas (including the Deep Water Site)

Table Legend:

X = The EFH for the particular species and life stage occurs in the Columbia River Channel Improvement Project action area (including the Deep Water site).

Blank = The EFH for the particular species and life stage is not currently known to occur within the action area, or insufficient information is currently available to establish occurrence within the action area.

NA = Not applicable. It is used in two ways: when a species does not have a particular life stage in its life history (gray background), ***or*** when EFH of juveniles is not identified separately for small juvenile and large juvenile stages. For many species, habitats occupied by juveniles differ substantially, depending on the size (or age) of the fish. Frequently, small juveniles are pelagic and large juveniles live on or near the bottom; these life stages are identified separately in the following tables when sufficient information is available to do so. When juvenile habitats do not differ so substantially ***or*** when information is insufficient to identify differences, EFH is identified only for the juvenile stage (small and large juveniles combined), and NA (not applicable) is listed in the column for the large juvenile stage in the tables.

Information in this table compiled from:

Casillas, E., L. Crockett, Y. deReynier, J. Glock, M. Helvey, B. Meyer, C. Schmitt, M. Yoklavich, A. Bailey, B. Chao, B. Johnson, and T. Pepperell, 1998. Essential Fish Habitat West Coast Groundfish Appendix. Seattle, Washington, National Marine Fisheries Service: 778 pp.

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Love, M.S. 1991. Probably more than you want to know about the fishes of the Pacific Coast. Really Big Press, Santa Barbara, California. 215 pp.

Pacific Fishery Management Council. 2003. Final Environmental Impact Statement for the Proposed Groundfish Acceptable Biological Catch and Optimum Yield Specifications and Management Measures: 2003 Pacific Coast Groundfish Fishery. Pacific Fishery Management Council, Portland, Oregon.

Table 3. Fish Species with EFH in the Columbia River Channel Improvement Project Action Areas (including the Deep Water Site)